

REMARKS

Claims 32-43 are amended. Claims 32-43 are pending.

The amendments to the claims are based on the application as originally filed, so it is respectfully submitted that no new matter has been added.

In the office action, claims 32-43 were finally rejected under 35 U.S.C. § 112, first and second paragraph. Claims 32-43 are amended to overcome the rejections, so reconsideration and withdrawal of the rejections are respectfully requested.

In the office action, claims 32-43 were finally rejected under 35 U.S.C. § 103(a) in view of U.S. Patent Numbers 4,655,842 to Ou et al. and 3,325,340 to Walker.

Pending claims 32-43 are patentable over the cited art, and so are in condition for allowance, since both Ou and Walker, individually or in combination, cannot teach or direct a person skilled in the art to use the layered silicate intercalation compounds defined in the present claims as an intumescent fire protection additive for the manufacture of flame-proof materials, as in the present invention.

Ou fails to disclose or suggest the present invention, since Ou instead discloses vermiculite dispersions and methods of preparing such vermiculite dispersions, with such dispersions and vermiculite contained therein being completely useless as an intumescent fire protection additive, because the resulting vermiculite crystals obtained by the process of Ou cannot be expanded further in the materials of the Ou reference.

Furthermore, there is no information, disclosure, or suggestion in Ou or Walker to indicate that, when using the intercalate compounds recited in the present claims, it is possible to control the volume of expansion and/or an onset temperature; that is, the expansion properties of the layered silicate intercalation compounds, in such a way that the expansion and/or the onset temperature is adapted to required properties of the flame-proof materials.

Referring to the Ou reference, although Example 1 of Ou discloses the treatment of vermiculite ore with lithium citrate tetrahydrate, it is explicitly also stated in Ou in connection with Example 1 that the mixture is stirred until it is homogeneous and allowed to stand for an additional 24 hours at room temperature. Then the mixture in Example 1 of Ou is transferred into a 2.0 L graduated cylinder, then the supernatant is decanted, and 500 mL of water are added. After 10 minutes, the mixture is decanted, and the process of water addition and decantation are repeated four times. In the second paragraph of Example 1 of Ou, it is stated that “the vermiculite began to swell almost immediately with the first 500 ml. wash, and reached its maximum volume about 10 minutes after the last wash”.

The properties of the resultant material are summarized in Table 1 in column 6 of the Ou reference. Therefore, the treatment in Ou is only carried out to demonstrate that lithium citrate is markedly superior as a swelling agent to various other lithium salts, which is a fact that is disclosed in the paragraph of Ou following Table 1, in column 6, lines 26-29.

However, such a treatment of vermiculite with lithium citrate is only the preceding step of the method disclosed in the Ou reference, which clearly sets out to provide aqueous vermiculite dispersions “which comprise a suspension of the delaminated platelets and citrate anion”, as disclosed in the last sentence of the Ou reference.

Such a suspension of delaminated platelets and a citrate anion is obtained according to the process defined in claim 1 of the Ou reference, by first treating the vermiculite crystals with citrate anion, immersing the treated crystals in water, and permitting the immersed crystals to swell as described in Example 1 of the Ou reference. Then this process is followed by a necessary step to provide the delaminated platelets by “subjecting the resultant swollen crystals while immersed in water to a shearing force to delaminate the vermiculite crystal and to form a suspension of delaminated vermiculite platelets”, as described in claim 1 of Ou.

Therefore, the Ou reference clearly discloses aqueous suspensions of delaminated vermiculite platelets, that is, platelets which are no longer in stacks of layered vermiculite silicate, but instead are exfoliated layered silicates as shown, for example, in FIG. 8 on page 5 of the publication KU Kunststoffe, Jahrg, '91 (2001), pages 128-190. Such delaminated vermiculite platelets are no longer capable of being expanded, due to such expandability requiring that the vermiculite particles consist of stacks of silicate layers.

Accordingly, the prior art Ou reference cannot direct a person having ordinary skill in the art to the subject matter of the present invention, since the present invention requires expandable vermiculite, as recited in the amended claims of the present invention.

Additionally, the prior art Ou reference cannot direct a person having ordinary skill in the art to the subject matter of the present invention, since the Ou reference fails to disclose, suggest, or provide any information directed to the use of such suspensions of delaminated vermiculite platelets as an “intumescent” fire protection additive, because such platelets in Ou are no longer expandable or intumescent when heated.

It is respectfully submitted that the alleged finding of the present invention as obvious in view of the Ou reference is clearly based on hindsight, and is not substantiated by the disclosure of the Ou reference, in view of the reasons set forth herein.

The Walker reference discloses an aqueous suspension of vermiculite flakes by treating crystals of vermiculite with a solution containing a water-soluble salt of a cation. Then the treated crystals are immersed in water, and the resulting swollen crystals are subjected, while immersed in water, to intense mechanical shearing to form a stable suspension of vermiculite flakes, as described in claim 1 of the Walker reference.

Therefore, the result of the Walker process leads to the formation of a suspension of delaminated flakes or platelets of vermiculite which, as with the Ou reference, are no longer capable of expanding, and so the results of the Walker process cannot be used as an intumescent fire-protecting additive. Even when using the ore of Walker in the process of Ou, such a combination of the teachings of Walker and Ou will not lead to an expandable layered silicate intercalation compound which can be used as an intumescent fire-protection additive, and which necessarily requires the property that the layered silicate will expand upon heating, as occurs in the present invention.

Thus, it is respectfully submitted that the examiner is incorrect in finding that there is no difference in the expandability of the vermiculite obtained according to the methods disclosed in Ou or in Walker. One having ordinary skill in the art would recognize the differences between the present invention and the cited art, since the elements, steps, and features of the present invention require that the vermiculite is only treated with the intercalate compounds recited in the claims, and then left to stand for a certain time, for example, three days at room temperature.

The present invention is contrary to the methods of both Ou and Walker, since the treatment of the present invention does not include or require the step or subjecting the swollen vermiculite crystals to intense chemical and physical shearing while immersed in water, as in Ou and Walker, in which such prior art methods of Ou and Walker provide a delamination of the vermiculite and the formation of delaminated vermiculite flakes or platelets. Such delaminated platelets or flakes in the prior art of Ou and Walker are incapable of further expansion, because such platelets and flakes no longer have layer structures for expansion, for example, as shown in the middle and left-hand side of FIG. 8 of the publication of KU Kunststoffe, Jahrg, '91 (2001), pages 128-190.

Instead, the delaminated platelets or flakes in the prior art of Ou and Walker are in an exfoliated delaminated form, for example, as shown in the right-hand side of FIG. 8 of the publication of KU Kunststoffe, Jahrg, '91 (2001), pages 128-190. Accordingly, the materials of Ou and Walker, after processing, cannot be expanded any further under the influence of heat, and therefore the resultant materials of Ou and Walker cannot be used as an intumescent fire-protection additive, as can the materials formed by the present invention, which require the expandability of the materials.

Therefore, all pending rejected claims 32-43 are patentable over Ou and Walker, so reconsideration and withdrawal of the final rejection of claims 32-43 are respectfully requested.

Entry and approval of the present amendment and allowance of all pending claims are respectfully requested.

In case of any deficiencies in fees by the filing of the present amendment, the Commissioner is hereby authorized to charge such deficiencies in fees to Deposit Account Number 01-0035.

Respectfully submitted,

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